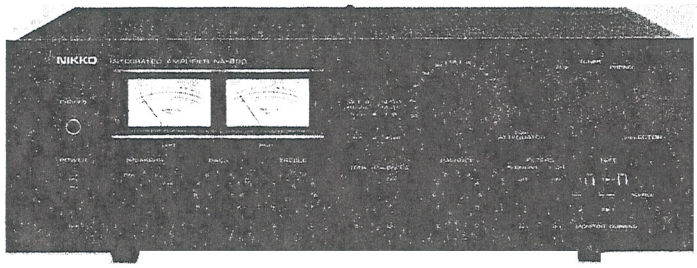
Nikko AMPLIFIER

NA-890

INTEGRATED AMPLIFIER



TYPE AND VOLTAGE

W-TYPE UL and CSA type	120V AC
E-TYPE NK-STD type	220/240V AC
N-TYPE DEMKO and SEMKO type	
D-TYPE DIN type	

SERVICE MANUAL

CONTENTS

SPECIFICATIONS 1, 2
BROCK DIAGRAM 2
DISASSEMBLY 3
PARTS LOCATION 4
ALIGNMENT 5
SCHEMATIC DIAGRAM 6, 7
P. C. BOARD 8, 9
PARTS LIST ..... 10 ~ 13
SEMICONDUCTOR DATA 14

SPECIFICATIONS

W-TYPE, E-TYPE, N-TYPE

Continuous Power Output, 8 ohm loads:
- 20 Hz – 20 KHz, @ 0.04 % THD . . . . . 70 Watts
- 1 KHz, @ 0.04 % THD . . . . . 75 Watts

TH Distortion, 8 ohm loads:
- @ Continuous Power Output . . . . . < 0.04 %
- @ 1 Watt Power Output . . . . . < 0.04 %

IM Distortion, 8 ohm loads:
- @ Continuous Power Output . . . . . < 0.04 %
- @ 1 Watt Power Output . . . . . < 0.04 %

IHF Power Bandwidth:
- @ 8 ohm loads . . . . . 10 Hz – 30 KHz

Damping Factor, 8 ohm loads, @ 1 KHz 60

Frequency Response, 8 ohm loads:
- PHONO → TAPE OUT
  . . . . . < RIAA ± 1 dB @ 30 Hz – 15 KHz
- TUNER, AUX, TAPE IN → SP. TER
  . . . . . < ± 2 dB @ 10 Hz – 30 KHz

Input Sensitivity for 70 Watts Power Output, @ 1 KHz:
- PHONO . . . . . 2.3 mV ± 2 dB
- TUNER, AUX, TAPE IN . . . . . 140 mV ± 2 dB

Phono Overload, @ 1 KHz, @ 0.1 % THD . 220 mV ± 2 dB

Output Level @ 2.3 mV Input, @ 1 KHz:
- PHONO → TAPE OUT . . . . . 140 mV ± 2 dB

Signal to Noise Ratio, IHF "A" Network:
- PHONO . . . . . < 80 dB
- TUNER, AUX, TAPE IN . . . . . < 90 dB

Tone Control
- BASS @ 70 Hz . . . . . ± 10 ± 2 dB
- TREBLE @ 10 KHz . . . . . ± 10 ± 2 dB

High Cut Filter, @ 7 KHz . . . . . – 3 ± 2 dB

Low Cut Filter, @ 20 Hz . . . . . – 3 ± 2 dB

Loudness Control, (VOLUME: –30 dB)
- @ 70 Hz . . . . . + 6 ± 2 dB
- @ 10 KHz . . . . . + 3 ± 2 dB

Audio Muting:
- @ 0 dB (0.775 V) Power Output . . . . . –20 ± 2 dB

Idling Current . . . . . $20\ ^{+20}_{-10}$ mA

Midpoint Voltage . . . . . 0 ± 50 mV

Mute Time . . . . . 5 ± 3 Seconds

D-TYPE

Continuous Power Output, 4 ohm loads:
- 20 Hz – 20 KHz, @ 0.1 % THD . . . . . 70 Watts
- 1 KHz, @ 1 % THD . . . . . 80 Watts

TH Distortion, 4 ohm loads:
- @ Continuous Power Output . . . . . < 0.1 %
- @ 1 Watt Power Output . . . . . < 0.08 %

IM Distortion, 4 ohm loads:
- @ Continuous Power Output . . . . . < 0.1 %
- @ 1 Watt Power Output . . . . . < 0.08 %

Power Bandwidth, 4 ohm loads:
- @ 0.1 % THD . . . . . 10 Hz – 30 KHz

Damping Factor, 4 ohm loads, @ 1 KHz 45

Output Level @ 2.3 mV Input, @ 1 KHz:
- PHONO → TAPE OUT . . . . . 15 mV ± 2 dB

Signal to Noise Ratio, DIN Filter:
- PHONO . . . . . < 60 dB
- TUNER, AUX, TAPE IN . . . . . < 80 dB

Tone Control
- BASS @ 70 Hz . . . . . ± 10 ± 2 dB
- TREBLE @ 10 KHz . . . . . ± 10 ± 2 dB

High Cut Filter @ 7 KHz . . . . . – 3 ± 2 dB

Low Cut Filter @ 20 Hz . . . . . – 3 ± 2 dB

Loudness Control, (VOLUME: – 30 dB)
- @ 70 Hz . . . . . + 6 ± 2 dB

Frequency Response, 4 ohm loads:

PHOTO → TAPE OUT

. . . . . < RIAA ± 1 dB 30 Hz – 15 KHz

TUNER, AUX, TAPE IN → SP. TER

. . . . . < ± 2 dB @ 10 Hz – 30 KHz

Input Sensitivity for 80 Watts Power Output, @ 1 KHz:

PHONO . . . . . 2.3 mV ± 2 dB

TUNER, AUX, TAPE IN . . . . . 140 mV ± 2 dB

Phono Overload, @ 1 KHz, @ 0.1 % THD . 210 mV ± 2 dB

Dimension

Width . . . . . 16 - 1/2 in. (420 mm)

Height . . . . . 5 - 3/8 in. (138 mm)

Depth . . . . . 13 - 1/8 in. (335 mm)

Weight . . . . . 24.2 lbs. (11 Kg)

Specifications subject to change without notice.

@ 10 KHz . . . . . + 3 ± 2 dB

Audio Muting:

@ 0 dB (0.775 V) Power Output . . . . . – 20 ± 2 dB

Idling Current . . . . . $20 \begin{smallmatrix}+20\\-10\end{smallmatrix}$ mA

Midpoint Voltage . . . . . 0 ± 50 mV

Mute Time . . . . . 5 ± 3 Seconds

BLOCK DIAGRAM

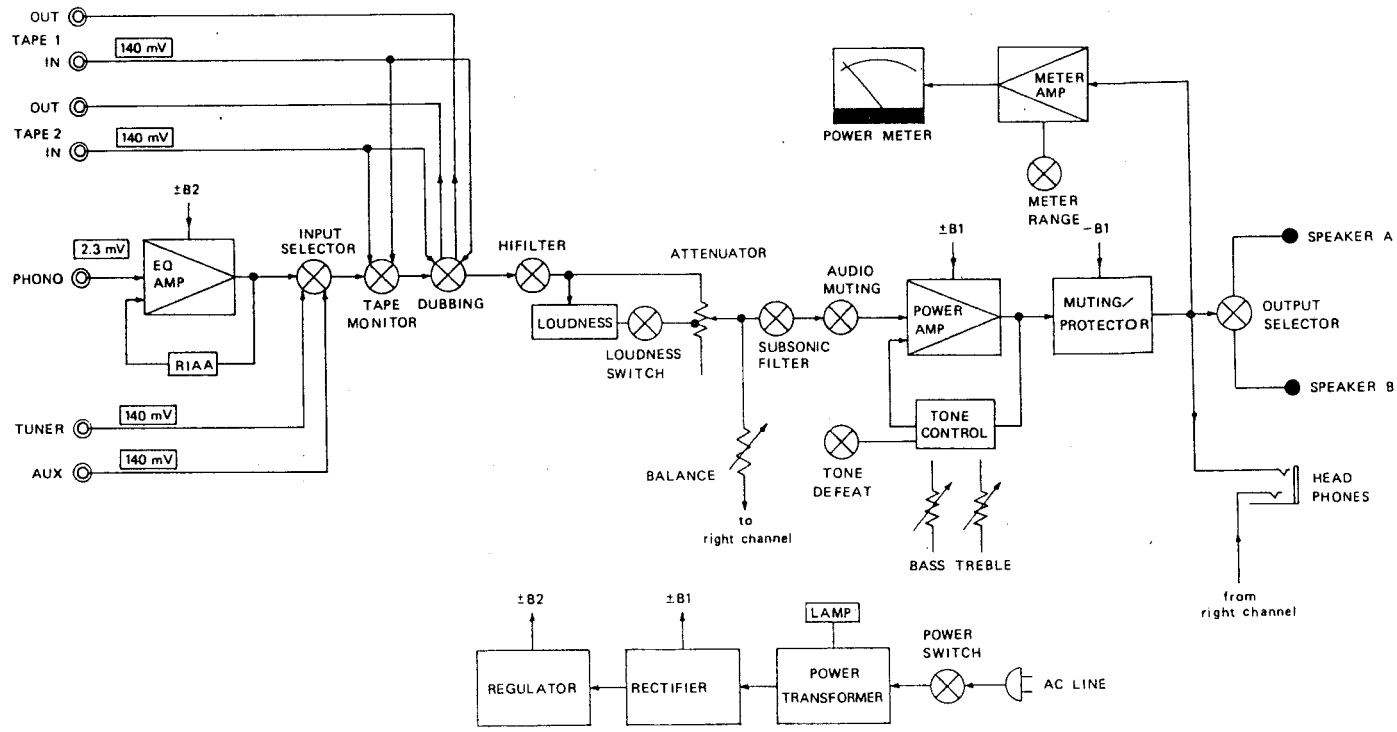


Figure 1

DISASSEMBLY

CABINET COVER REMOVAL

Remove three tapping screws from the top of the metal cover.
Remove six screws from both sides of the metal cover.

BOTTOM PLATE REMOVAL

Remove nine tapping screws (No. 3 ~ 11) (Photo 1) from the bottom of the unit.

FRONT PANEL REMOVAL

1. Using hexagonal wrench, remove two knobs (ATTENUATOR, SELECTOR) from the front of the unit.
2. Remove eleven knobs (POWER, SPEAKERS, BASS, TREBLE, TONE DEFEAT, LOUDNESS, BALANCE, SUBSONIC HI-FILTER, MONITOR, DUBBING) from the front of the unit by pulling them forward.
3. Remove four tapping screws (No. 1, 2) (Photo 1), (No. 1, 2) (Photo 2).
4. Lift the front panel away from the unit.

POWER TRANSFORMER REMOVAL

1. Disconnect all the power transformer cables.
2. Remove four screws (No. 3 ~ 6) (Photo 2) from the bottom plate.
3. Lift the power transformer away from the unit.

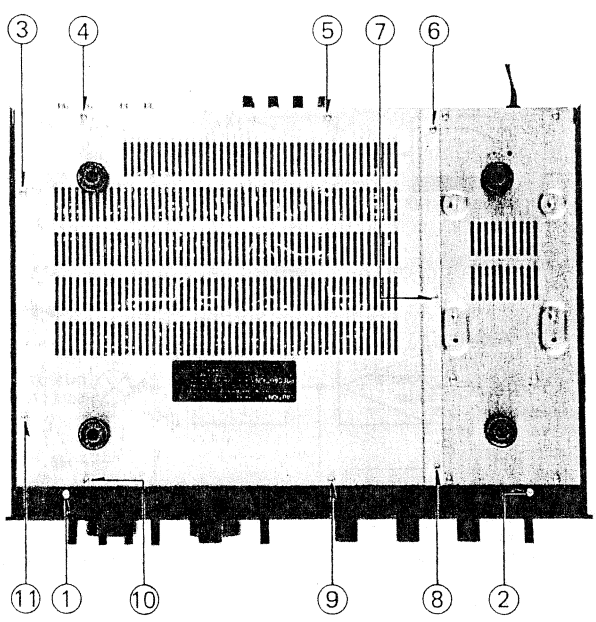


Photo 1

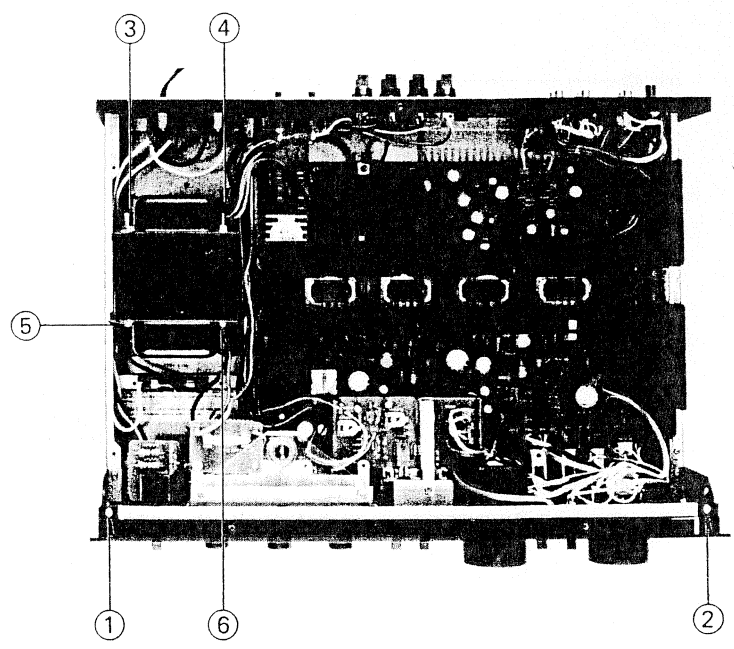


Photo 2

PARTS LOCATION

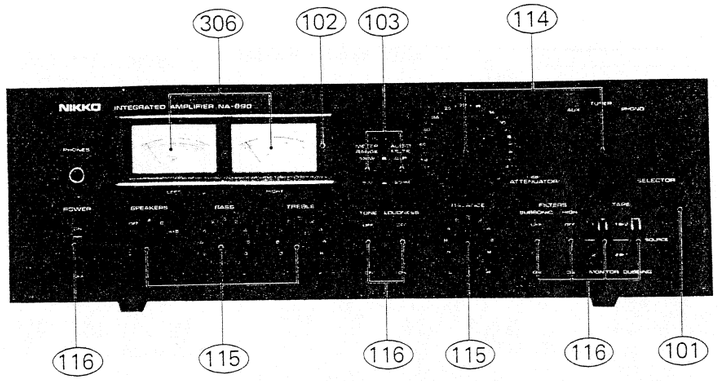


Photo 3

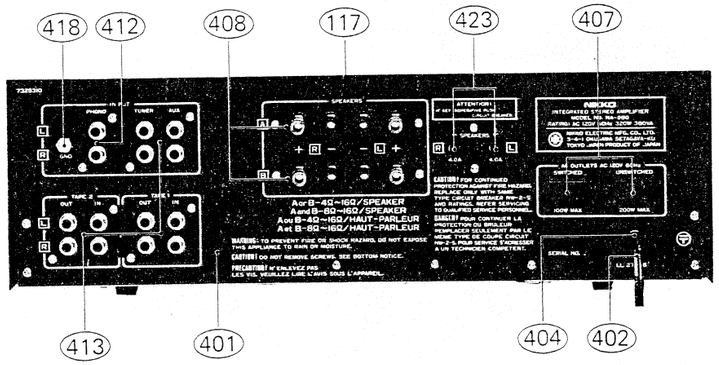


Photo 4

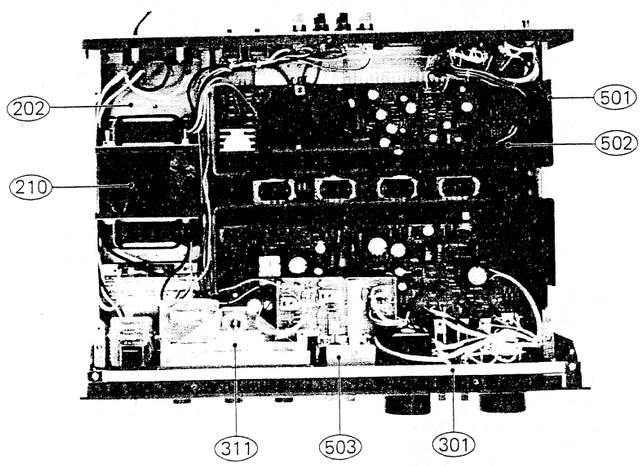


Photo 5

ALIGNMENT

TEST EQUIPMENT

Allow a minimum of 10 minutes warm-up for test equipment and the amplifier to be tested.
Maintain line voltage.

Generator – Audio Frequency
DC Voltmeter – High Sensitivity
Vacuum Tube Voltmeter
(Oscilloscope)

Connect 8 ohm dummy loads to both L and R channel speaker terminals of the amplifier.

IDLING CURRENT ADJUSTMENT

(See Amp PC Board and Fig. 2)
Idling current is obtained by measuring the voltage of the emitter resistor connected to the power transistor.

Left Channel:

1. Connect DC Voltmeter in accordance with Fig. 2.
2. Apply no signal to the amplifier.
3. Adjust potentiometer HVR701 so that the voltage drop across R751 is 6.6 (or 3.3 to 13.2) millivolts.

Right Channel:
Similarly, adjust potentiometer HVR702 so that the voltage drop across R752 is 6.6 (or 3.3 to 13.2) millivolts.

METER LEVEL ADJUSTMENT

(See Meter Control Circuit Board)

1. Set potentiometers HVR901 and HVR902 to mid-range.
2. Connect Generator to "AUX" of the amplifier.
3. Apply sine wave (1 kHz) to the amplifier.

Left Channel:

1. Push "METER RANGE" switch to "5W" position.
2. Set Generator and "ATTENUATOR" to obtain 5 watts (6.3 Volts into 8 ohms load).
3. Adjust potentiometer HVR901 so that the power meter reads 5 watts.

Right Chennel:
Similarly, adjust potentiometer HVR902 so that the power meter reads 5 watts.

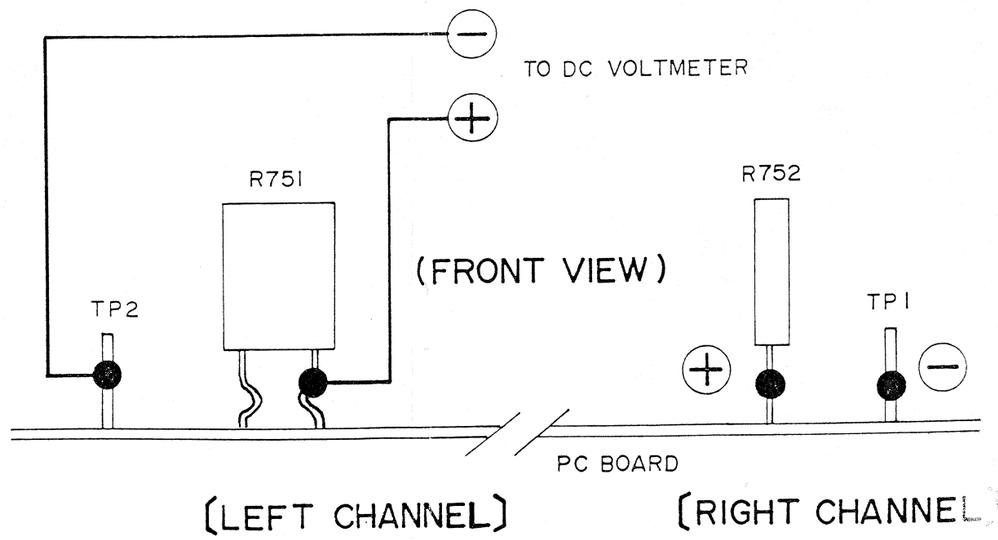
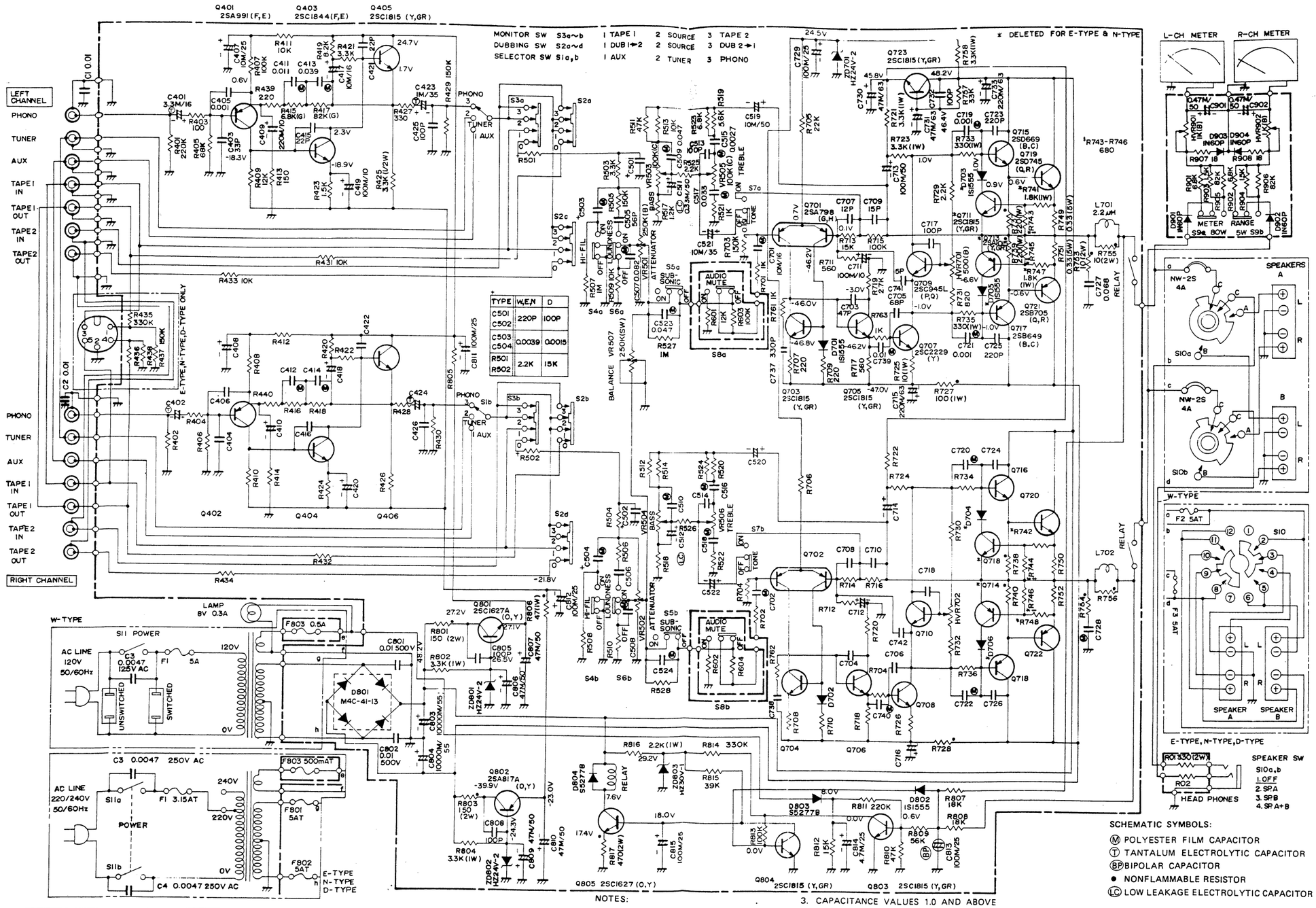


Figure 2

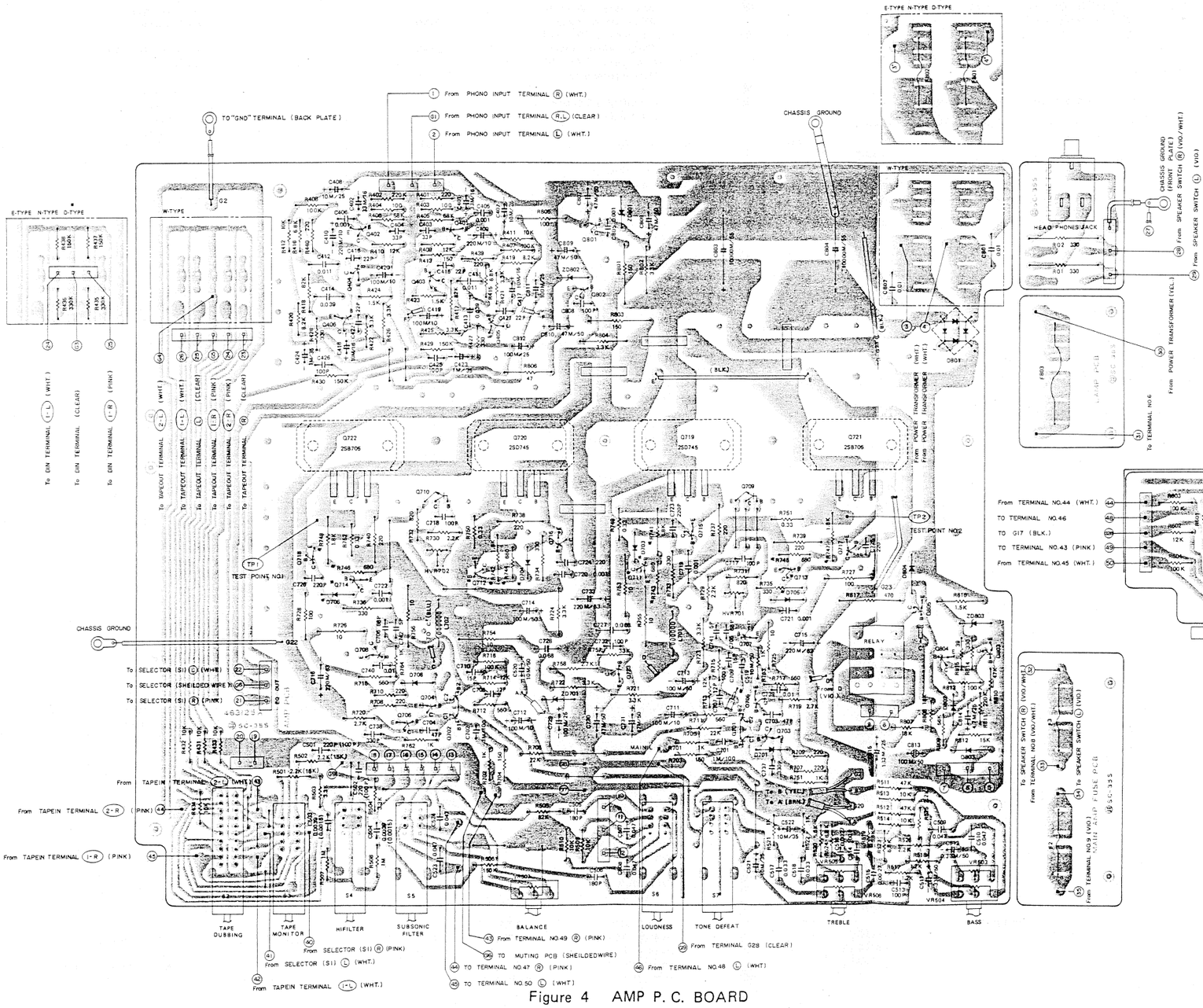
SCHEMATIC DIAGRAM


Q401 2SA991(F,E)
Q403 2SC1844(F,E)
Q405 2SC1815 (Y,GR)
MONITOR SW S3a~b 1 TAPE 1 2 SOURCE 3 TAPE 2
DUBBING SW S2a~d 1 DUB 1→2 2 SOURCE 3 DUB 2→1
SELECTOR SW S1a,b 1 AUX 2 TUNER 3 PHONO
* DELETED FOR E-TYPE & N-TYPE
L-CH METER
R-CH METER
LEFT CHANNEL
RIGHT CHANNEL
PHONO
TUNER
AUX
TAPE 1 IN
TAPE 1 OUT
TAPE 2 IN
TAPE 2 OUT
E-TYPE, N-TYPE, D-TYPE ONLY
W-TYPE
E-TYPE, N-TYPE, D-TYPE
SPEAKERS
SPEAKER A
SPEAKER B
HEAD PHONES
SPEAKER SW
S10a,b
1. OFF
2. SP A
3. SP B
4. SP A+B
RELAY
LAMP 8V 0.3A
S11 POWER
AC LINE 120V 50/60Hz
AC LINE 220/240V 50/60Hz
POWER
UNSWITCHED
SWITCHED
HI-FIL
LOUDNESS
ATTENUATOR
SUB-SONIC
AUDIO MUTE
BASS
TREBLE
BALANCE
TONE
NW-2S 4A
F2 5AT
F3 5AT
F803 0.5A
F803 500mAT
F801 5AT
F802 5AT
D801 M4C-41-13
Q801 2SC1627A (O,Y)
Q802 2SA817A (O,Y)
Q803 2SC1815 (Y,GR)
Q804 2SC1815 (Y,GR)
Q805 2SC1627 (O,Y)
Q701 2SA798 (G,H)
Q702
Q703 2SC1815 (Y,GR)
Q704
Q705 2SC1815 (Y,GR)
Q706
Q707 2SC2229 (Y)
Q708
Q709 2SC945L (P,Q)
Q710
Q711 2SC1815 (Y,GR)
Q712
Q715 2SD669 (B,C)
Q716
Q717 2SB649 (B,C)
Q718
Q719 2SD745 (Q,R)
Q720
Q721 2SB705 (Q,R)
Q722
Q723 2SC1815 (Y,GR)
Q741
Q742
Q743
Q744
Q745
Q746
Q747
Q748
Q749
Q750
Q751
Q752
Q753
Q754
Q755
Q756
Q757
Q758
Q759
Q760
Q761
Q762
Q763
Q764
Q765
Q766
Q767
Q768
Q769
Q770
Q771
Q772
Q773
Q774
Q775
Q776
Q777
Q778
Q779
Q780

PC BOARD (BOTTOM VIEW)

WIREING GUIDE

5. (G25) From POWER TRANSFORMER (GRY.)
   To PILOT LAMP (BLK.)
6. From TERMINAL NO. 31 (YEL.)
   To PILOT LAMP (BLK.)
7. (G24) To POWER METERS (BLK.)
8. To CIRCUIT BREAKER R (VIO/WHT.)–W–TYPE only
   To TERMINAL NO. 33 (VIO/WHT.)–E, N, D–TYPE
   To TERMINAL NO. 36 (VIO/WHT.)
9. To CIRCUIT BREAKER L (VIO.)–W–TYPE only
   To TERMINAL NO. 35 (VIO.)–E, N, D–TYPE
   To TERMINAL NO. 39 (VIO.)
10. To VR501 (VOLUME) L (WHT.)
11. (G15) To VR502 (VOLUME) R (CLEAR)
12. To VR502 R (PINK)
13. From VR502 R (PINK)
14. (G11) From VR502 (CLEAR)
15. From VR501 L (WHT.)
16. From VR502 R (PINK)
17. From VR501 L (WHT.)
18. (G10) From VR501 (CLEAR)
19. (G8) To LUG (FRONT PLATE) (CLEAR)
20. (G7) To LUG (FRONT PLATE) (CLEAR)



NOTE: *DELETED IN E–TYPE & N–TYPE
( ) USED IN D–TYPE ONLY.

Figure 4 AMP P. C. BOARD

PARTS LIST

The KEY NUMBER (#) marked with a (*) on parts list relate to numbers of three digits with a (◯). (Photo 3 – 5)

Numberals in file indicate the quantity of parts used in one type.

TR : Transistor
FET : Field effect transistor
VR : Volume control (Variable resistor)
RES : Carbon film fixed resistor
MO-RES : Metal oxide film fixed resistor
CE-RES : Cemented wirewound fixed resistor
FP : Flame proof
C-CAP : Ceramic capacitor
E-CAP : Aluminium electrolytic capacitor
M-CAP : Polyester film capacitor
S-CAP : Polystyrene film capacitor
T-CAP : Tantalum electrolytic capacitor
BP-CAP : Bipolar electrolytic capacitor
LC-CAP : Low leakage electrolytic capacitor

4. Assemblies and parts are subject to change without notice.

5. Parts ordering procedure:
   A. Do NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only)
   B. Include in any order
      a. Part number.
      b. Part description.
      c. Model number.
      (any of the above lacking from an order may delay shipment of that order.)

PART ORDERING PROCEDURE ····· Do NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only.) Include in any order: a. Part number, b. Part description, c. Model number. (any of the above lacking from an order may delay shipment of that order.)

KEY NO.	SYMBOL NO.	TYPE+ (W·E·N·D)	DESCRIPTION++	PART NO.
			PACKING MATERIALS & ACCESSORIES	
301		1111	Carton box	9825450
302		2222	Pad	9840770
303		1111	Sack, polyethylen cloth	9640550
304		1111	Cloth, polishing	9690040
305		111–	Sack, polyethylen cloth – # 13	9640320
306a		1–––	Manual, instruction – E	960252E
306b		–1––	Manual, instruction – K	960253K
306c		––– 1	Manual, instruction – G	960254G
307		––– 1	Envelope – G	969017O
308a		1–––	Service station list	9690180
308b		1–––	Card, warranty	967007A
309		1111	Drier – Sllica gel	9690010
			CABINET ASSEMBLY	
*101a		1111	Panel, front – SILVER	7884210
*101b		1111	Panel, front – BLACK	7884220
102		1111	Window, meter	7802360
103		2222	Button, push – meter range/muting	7401550
104		2222	Guide, for push button	7401560
105		2222	Stopper, for push button	7401460
106		2222	Spring – (V)	7440400
107		1111	Guide – 2S, for lever switch	7401610
108		2222	Guide – 2T, for lever switch	7401590
109		1111	Guide – 3T, for lever switch	7401600
110		4444	Screw – PTS 3φx8	814308S
111		7777	Dust cover, for lever switch	7002000
112		1111	Blind plate – FL	7002010
113		1111	Blind plate – FU	7002020
*114a		2222	Knob – 19SL-42DA – attenuator/ selector, SILVER	7841290
*114b		4444	Knob – 19SL-19DR – bass/treble/balance/ speaker selector, SILVER	7841250
*115a		7777	Knob – 19SL-8LS, for lever switches, SILVER	7841190
*114b		2222	Knob – 19BK-42D – attenuator/ selector, BLACK	7841160
*115b		4444	Knob – 19BK-19D – bass/treble/balance/ speaker selector, BLACK	7841140
*116b		7777	Knob – 19BK-8LS, for lever switches, BLACK	7841200
*117		1111	Cover, metal	7820890
118		6666	Screw – TFTS 4φx10	887410W
119		6666	Washer – 4φ	893104W
120		3333	Screw – PTS 3φx6	814306W
121		1111	Plate, bottom	7325260
122		9999	Screw – PTS 3φx6	814306S
123		4444	Foot – 23φx12	7401800
124		4444	Screw – PTS 3φx10	814310S
			CHASSIS ASSEMBLY	
*201		1111	Angle, right side	7226710
*202		1111	Chassis, for power transformer	7325280
		1111	(FRONT PLATE ASSEMBLY)	
203		9999	Screw – PTS 3φx6	814306S
		1111	(BACK PLATE ASSEMBLY)	
204		7778	Screw – PTS 3φx6	814306S
205		––– 1	Washer – TW (1) 3φ	893403U
		1111	(AMP PCB ASSEMBLY)	
206		4444	Screw – PTS 3φx10	814310S
207		3333	Screw – PTS 3φx8	814308S
208		1111	Washer – TW (1) 3φ	893403U
209		1111	Lug, ground – 4P	4400080
*210a		1–––	Transformer, power – T-1-332 – 120 V only	1103320
*210b		–111	Transformer, power – T-1-333 – 220/240 V class II	1103330
211		4444	Screw, tap tite – 4φx6	7121110
212		1111	Bracket, power transformer	7032080
213		4444	Screw – PTS 3φx6	814306S
		–111	(POWER AMP FUSE PCB ASSEMBLY)	
214		–222	Screw – PTS 3φx6	814306S
215		1111	Lug, GND	4400000
216		1111	Screw – PTS 3φx6	814306S
217		1111	Washer – TW (1) 3φ	893403U
218a		1–––	Fuse holder – 1P	4581840
218b		–111	Fuse holder, midget fuse – 1P	4581430
219		1–––	Screw – PTS 3φx8	814308S
220		–111	Screw – PMS 3φx8	810308S
221		–111	Washer – IN 3φ	892013S
222		–111	Washer – TW (1) 3φ	893403U
223a	F1	1–––	Fuse – 5A 250V MGC	4700540
223b	F1	–111	Midget fuse – (S) 3.15 A 250 V	4720390
			FRONT PLATE ASSEMBLY	
*301		1111	Plate, front	7325270
302a	S11	1–––	Switch, lever – SDA1L TV-5 – power, spst	4025370
302b	S11	–111	Switch, lever – SDE3L class II – power, dpst	4025380
303		2222	Screw – PMS 3φx6	810306S
				4050990
304a	S10	1–––	Switch, rotary – SRY 1-2-4 25KC – speaker selector	4050990
304b	S10	–111	Switch, rotary – SRY 1-4-4 25KC – speaker selector	4051200
305	S1	1111	Switch, rotary – SRY 1-3-3 25R – input selector	4051220
	VR501 ~ 502	1111	VR – WKHG11 250kohm Bx2 25R – attenuator	4390150
*306		2222	Meter, power – 8ohm	4582470
307		1111	Holder, meter	7032190
308		2222	Screw – PTS 3φx6	814306S
		1111	(LAMP FUSE PCB ASSEMBLY)	
309		1111	Screw – PTS 3φx8	814308S
310		1111	Screw – PTS 3φx6	814306S
*311		1111	Reflex plate, meter	7401580
312		2222	Screw – PTS 3φx10	814310S
313		1111	Lamp – 8V 0.3 A	5808120
314		1111	Angle, reflex	7032460
315		1111	Panel, meter	7884280
		1111	(METER/MUTING PCB ASSEMBLY)	
316		1111	Bracket, push switch	7032070
317		2222	Screw – PMS 3φx6	810306S
318		3333	Screw – PTS 3φx6	814306S
319		1111	Washer – TW (1) 3φ	893403U
320		1111	Lug – 1L3P(L)	441131L
321		1111	Screw – PTS 3φx6	814306S
322		1111	Washer – TW (1) 3φ	893403U
		1111	(HEAD PHONES PCB ASSEMBLY)	
323		2222	Screw – PMS 3φx6	810306S
324		1111	Lug, ground	4400000
325		1111	Washer – TW (1) 3φ	893403U
	C3	1–––	C-CAP 0.0047uf AC125 V	239472C
	C3,C4	–222	C-CAP 0.0047uf AC250 V VDE	239472E
326		–222	Cover, C-CAP 23φ	7400980
			BACK PLATE ASSEMBLY	
*401a		1–––	Plate, back – W	7325310
*401b		–111	Plate, back – E	7325330
*402a		1–––	Plug/Cord – DP-70	606007A
*402b		–11–	Plug/Cord – CEE-2T	600506J
*402c		––– 1	Plug/Cord CEE-2T	600510A
403		––– 1	Lug, ground	4400000
*404a		1–––	Stopper, cord – SR-3P-4	7400620
*404b		–11–	Stopper, cord – SR-4N-4	7400690
*404c		––– 1	Stopper, cord – SR-6W-1	7400740
405		–111	Bracket, cord – EH	7029800
406		–222	Screw – PTS 3φx6	814306S
*407		2–––	Socket, AC outlet	4500150
*408		2222	Terminal, speaker – screw type – NK	4450480
409		4444	Screw – PTS 3φx8	814308S
410		1111	Holder, PCB	7032210
411		2222	Screw – PTS 3φx6	814306S
*412		1111	Terminal, RCA type pin jack – WP 1Px2	4442020
*413		3333	Terminal, RCA type pin jack – WP 2Px2	4444020
414		2222	Screw – PMS 3φx6	810306S
415		6666	Screw – PTS 3φx8	814308S
416		–111	Connector, DIN type 5P	4530220
417		–222	Screw – PTS 3φx6	814306S
	C1,C2	2222	C-CAP 0.01uf 80, –20 % 50V YG	231103Z
		1111	Lug, ground	4400000
*418		1111	Nut, GND terminal	7152060
419		1111	Shaft, GND terminal	7152050
420		1111	Washer – 1N 3φ	892013S
421		1111	Washer – TW (1) 3φ	893403U
422		1111	Washer – 3φ	893203D
*423		2–––	Circuit breaker – NW-2S 4.0 A	4900880
424		1–––	Bracket, circuit breaker – 2P	7030140
425		2–––	Screw – PTS 3φx6	814306S
			AMP PC BOARD ASSEMBLY	
		1–––	AMP PCB ASSEMBLY	9441450
		–11–	AMP PCB ASSEMBLY	9441370
		––– 1	AMP PCB ASSEMBLY	9441380
			(EQ AMP SECTION)	
Q401,402		2222	TR 2SA991 (E or F)	510104S
Q403,404		2222	TR 2SC1844 (E or F)	512106S
Q405,406		2222	TR 2SC1815 (Y or GR)	512107S
C401,402		2222	T-CAP 16D3.3uf	252213M
C403,404		2222	C-CAP 33pf 10 % 50V SL	232330K
C405,406		2222	C-CAP 0.001uf 80, –20 % 50V YG	231102Z
C407,408		2222	E-CAP 25R10uf	211320Q
C409,410		2222	E-CAP 10R220uf	211132Q
C411,412		2222	M-CAP 0.011uf 2% 50V	228113G
C413,414		2222	M-CAP 0.039uf 2% 50V	228393G
C415,416		2222	C-CAP 22pf 10% 50V SL	232220K
C417,418		2222	E-CAP 16R10	211220Q
C419,420		2222	E-CAP 10R100uf	211130Q
C421,422		2222	C-CAP 22pf 10% 50V SL	232220K
C423,424		2222	T-CAP 35D1uf	252410M
C425,426		2222	C-CAP 100pf 10% 50V SL	232101K
R401,402		2222	RES 220kohm 5% ¼W	328224J
R403,404		2222	RES 100ohm 5% ¼W	328101J
R405,406		2222	RES 68kohm 5% ¼W	328683J
R407,408		2222	RES 100kohm 5% ¼W	328104J
R409,410		2222	RES 12kohm 5% ¼W	328123J
R411,412		2222	RES 10kohm 5% ¼W	328103J
R413,414		2222	RES 150ohm 5% ¼W	328151J
R415,416		2222	RES, metal film 6.8kohm 2% ¼W	304682G
R417,418		2222	RES, metal film 82kohm 2% ¼W	304823G
R419,420		2222	RES 8.2kohm 5% ¼W	328822J
R421,422		2222	RES 3.3kohm 5% ¼W	328332J
R423,424		2222	RES 1.5 kohm 5% ¼W	328152J
R425,426		2222	RES 3.3kohm 5% ½W	329332J
R427,428		2222	RES 330ohm 5% ¼W	328331J
R429,430		2222	RES 150kohm 5% ¼W	328154J
R431,432		2222	RES 10kohm 5% ¼W	328103J
R433,434		2222	RES 10kohm 5% ¼W	328103J
R435,436		2222	RES 330kohm 5% ¼W	328334J
R437,438		2222	RES 100kohm 5% ¼W	328104J
R439,440		2222	RES 220ohm 5% ¼W	328221J
			(TONE AMP SECTION)	
VR503 ~ VR506		2222	VR GM70E644C – 100kohm C x 2 – bass/treble	4320860
VR507		1111	VR VM10E126C – 250kohm – balance	4310550

PART ORDERING PROCEDURE ----- Do NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only.) Include in any order: a. Part number, b. Part description, c. Model number. (any of the above lacking from an order may delay shipment of that order.)

KEY NO.	SYMBOL NO.	TYPE+ W-TYPE E-TYPE N-TYPE D-TYPE	DESCRIPTION++	PART NO.
	S2	1 1 1 1	Switch, lever SLR 5-4-3 – tape dubbing	4025310
	S3	1 1 1 1	Switch, lever SLR 523 – tape monitor	4025360
	S4~S7	4 4 4 4	Switch, lever SLR 522 – tone defeat/ loudness/subsonic/hi-filter	4025350
	C501,502	2 2 2 –	C-CAP 220pf 10% 50V SL	232221K
	C501,502	– – – 2	C-CAP 100pf 10% 50V SL	232101K
	C503,504	2 2 2 –	M-CAP 0.0039uf 10% 50V	222392K
	C503,504	– – – 2	M-CAP 0.0015uf 10% 50V	222152K
	C505,506	2 2 2 2	C-CAP 56pf 10% 50V SL	232560K
	C507,508	2 2 2 2	M-CAP 0.082uf 10% 50V	222823K
	C509,510	2 2 2 2	M-CAP 0.047uf 10% 50V	222473K
	C511,512	2 2 2 2	LC-CAP 50R0.33uf 20%	211503L
	C513,514	2 2 2 2	C-CAP 100pf 10% 50V SL	232101K
	C515,516	2 2 2 2	M-CAP 0.0027uf 10% 50V	222272K
	C517,518	2 2 2 2	M-CAP 0.033uf 10% 50V	222333K
	C519,520	2 2 2 2	E-CAP 50R10uf	211520Q
	C521,522	2 2 2 2	E-CAP 35R10uf	211420Q
	C523,524	2 2 2 2	M-CAP 0.047uf 10% 50V	222473K
	R501,502	2 2 2 –	RES 2.2kohm 5% ¼W	328222J
	R501,502	– – – 2	RES 15kohm 5% ¼W	328153J
	R503,504	2 2 2 2	RES 3.3kohm 5% ¼W	328332J
	R505,506	2 2 2 2	RES 150kohm 5% ¼W	328154J
	R507,508	2 2 2 2	RES 1meguohm 5% ¼W	328105J
	R509,510	2 2 2 2	RES 10kohm 5% ¼W	328103J
	R511,512	2 2 2 2	RES 47kohm 5% ¼W	328473J
	R513,514	2 2 2 2	RES 10kohm 5% ¼W	328103J
	R517,518	2 2 2 2	RES 1.2kohm 5% ¼W	328122J
	R519,520	2 2 2 2	RES 5.6kohm 5% ¼W	328562J
	R521,522	2 2 2 2	RES 1kohm 5% ¼W	328102J
			(POWER AMP SECTION)	
*501		1 1 1 1	Heat sink	7082090
*502		2 2 2 2	Heat sink, SUB	7082100
503		8 8 8 8	Screw – PTS 3φx8	814308S
504		2 2 2 2	Screw – PTS 3φx6	814306S
	Q701,702	2 2 2 2	TR 2SA798 (G or H)	514086S
	Q703,704	2 2 2 2	TR 2SC1815 (Y or GR)	512107S
	Q705,706	2 2 2 2	TR 2SC1815 (Y or GR)	512107S
	Q707,708	2 2 2 2	TR 2SC2229 (Y)	512108S
	Q709,710	2 2 2 2	TR 2SC945L (P or Q)	515077S
	Q711,712	2 – – 2	TR 2SC1815 (Y or GR)	512107S
	Q713,714	2 – – 2	TR 2SA1015 (Y)	510102S
	Q715,716	2 2 2 2	TR 2SD669 (B or C)	513104S
	Q717,716	2 2 2 2	TR 2SB649 (B or C)	511104S
	Q719,720	2 2 2 2	TR 2SD745 (Q or R)	513103S
	Q721,722	2 2 2 2	TR 2SB705 (Q or R)	511103S
	Q723	1 1 1 1	TR 2SC1815 (Y or GR)	512107S
	D701 ~ D706	6 2 2 6	Diode 1S1555	501021S
	ZD701	1 1 1 1	Zener Diode HZ24V-2	502053S
	L701,702	2 2 2 2	Coil, choke – 15T 2.2uh	1210940
	C701,702	2 2 2 2	M-CAP 1uf 10% 100V	282105K
	C703,704	2 2 2 2	C-CAP 47pf 10% 50V SL	232470K
	C705,706	2 2 2 2	C-CAP 68pf 10% 50V SL	232680K
	C707,708	2 2 2 2	C-CAP 12pf 10% 50V SL	232120K
	C709,710	2 2 2 2	C-CAP 15pf 10% 50V SL	232150K
	C711,712	2 2 2 2	E-CAP 10R100uf	211130K
	C713,714	2 2 2 2	E-CAP 50R100uf	211530Q
	C715,716	2 2 2 2	E-CAP 63R220uf	
	C717,718	2 2 2 2	C-CAP 100pf 10% 50V SL	232101K
	C719,720	2 2 2 2	M-CAP 0.001uf 10% 50V	222102K
	C721,722	2 2 2 2	M-CAP 0.001uf 10% 50V	222102K
	C723,724	2 2 2 2	C-CAP 220pf 10% 50V SL	232221K
	C725,726	2 2 2 2	C-CAP 220pf 10% 50V SL	232221K
	C727,728	2 2 2 2	M-CAP 0.068uf 10% 50V SL	222683K
	C729	1 1 1 1	E-CAP 25R100uf	211330Q
	C730,731	2 2 2 2	E-CAP 63R47uf	211625Q
	C732	1 1 1 1	C-CAP 100pf 10% 50V SL	232101K
	C733	1 1 1 1	E-CAP 63R220uf	211632Q
	HVR701, HVR702	2 2 2 2	Potentiometer – HVR B500ohm	4300830
	R701,702	2 2 2 2	RES 1kohm 5% ¼W	328102J
	R703,704	2 2 2 2	RES 150kohm 5% ¼W	328154J
	R705,706	2 2 2 2	RES 22kohm 5% ¼W	328223J
	R707,708	2 2 2 2	RES 220ohm 5% ¼W	328221J
	R709,710	2 2 2 2	RES 220ohm 5% ¼W	328221J
	R711,712	2 2 2 2	RES 560 ohm 5% ¼W	328561J
	R713,714	2 2 2 2	RES 15kohm 5% ¼W	328153J
	R715,716	2 2 2 2	RES 100kohm 5% ¼W	328104J
	R717,718	2 2 2 2	RES 560 ohm 5% ¼W	328561J
	R719,720	2 2 2 2	RES 2.7kohm 5% ¼W	328272J
	R721,722	2 2 2 2	MO-RES 3.3kohm 5% 1W	361332B
	R723,724	2 2 2 2	MO-RES 3.3kohm 5% 1W	361332B
	R725,726	2 2 2 2	MO-RES 10ohm 5% 1W	361100B
	R727,728	2 2 2 2	FP-MO-RES 100ohm 5% 1W	361101L
	R729,730	2 2 2 2	RES 2.2kohm 5% ¼W	328222J
	R731,732	2 2 2 2	RES 820ohm 5% ¼W	328821J
	R733,734	2 2 2 2	MO-RES 330ohm 5% 1W	361331B
	R735,736	2 2 2 2	MO-RES 330ohm 5% 1W	361331B
	R737,738	2 2 2 2	FP-MO-RES 220ohm 5% 1W	361221L
	R739,740	2 2 2 2	FP-MO-RES 220ohm 5% 1W	361221L
	R741,742	2 – – 2	MO-RES 1.8kohm 5% 1W	361182B
	R743,744	2 – – –	RES 680ohm 5% ¼W	328681J
	R743,744	– – – 2	RES 680ohm 5% ¼W	328681J
	R745,746	2 – – –	RES 680ohm 5% ¼W	328681J
	R745,746	– – – 2	RES 680ohm 5% ¼W	328681J
	R747,748	2 2 2 2	MO-RES 1.8kohm 5% 1W	361182B
	R749,750	2 2 2 2	CEM-RES 0.33ohm 5% 5W	384339W
	R751,752	2 2 2 2	CEM-RES 0.33ohm 5% 5W	384339W
	R753,754	2 2 2 2	FP-MO-RES 10ohm 5% 2W	362100L
	R755,756	2 2 2 2	FP-MO-RES 10ohm 5% 2W	362100L
	R757	1 1 1 1	RES 33kohm 5% ¼W	328333J
	R758	1 1 1 1	MO-RES 3.3kohm 5% 1W	361332J
	R759,760	1 1 1 1	RES 820ohm 5% ¼W	328821J
	R761,762	2 2 2 2	RES 1kohm 5% ¼W	328102J
	R763,764	2 2 2 2	RES 1kohm 5% ¼W	328102J
			(REGULATOR SECTION)	
	Q801	1 1 1 1	TR 2SC1627A (O or Y)	512101S
	Q802	1 1 1 1	TR 2SA817A (O or Y)	510101S
	Q803,804	2 2 2 2	TR 2SC1815 (Y or GR)	512107S
	Q805	1 1 1 1	TR 2SC1627 (O or Y)	511017S
	D801	1 1 1 1	Diode M4C-41-13	560052S
	D802	1 1 1 1	Diode 1S1555	501021S
	D803,804	2 2 2 2	Diode S5277B	560046S
	ZD801~ ZD802	2 2 2 2	Zener Diode HZ24V-2	502053S
	ZD803	1 1 1 1	Zener Diode HZ30V-1	502054S
		1 1 1 1	Relay FRL-264 DC24V	1700230
	C801,802	2 2 2 2	C-CAP 0.01uf 100, –0 % 500V	238103P
	C803,804	2 2 2 2	E-CAP 55T10000uf	212150P
	C805	1 1 1 1	C-CAP 100pf 10% 50V SL	232101K
	C806,807	2 2 2 2	E-CAP 50R47uf	211525Q
	C808	1 1 1 1	C-CAP 100pf 10% 50V SL	232101K
	C809,810	2 2 2 2	E-CAP 50R47uf	211525Q
	C811,812	2 2 2 2	E-CAP 25R100uf	211330Q
	C813	1 1 1 1	BP-CAP 25R100uf	215330N
	C814	1 1 1 1	E-CAP 35R4.7uf	211415Q
	C815	1 1 1 1	E-CAP 25R100uf	211330Q
	R801	1 1 1 1	FP-MO-RES 150ohm 5% 2W	362151L
	R802	1 1 1 1	MO-RES 3.3kohm 5% 1W	361332B
	R803	1 1 1 1	FP-MO-RES 150ohm 5% 2W	362151L

NA-650

PART ORDERING PROCEDURE ----- Do NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only.) Include in any order: a. Part number, b. Part description, c. Model number. (any of the above lacking from an order may delay shipment of that order.)

KEY NO.	SYMBOL NO.	TYPE+ W E N D	DESCRIPTION++			PART NO.
	R804	1 1 1 1	MO-RES 3.3kohm	5%	1W	361332B
	R805	1 1 1 1	FP-MO-RES 100ohm	5%	1W	361101L
	R806	1 1 1 1	FP-MO-RES 47ohm	5%	1W	361470L
	R807,808	2 2 2 2	RES 18kohm	5%	¼W	328183J
	R809	1 1 1 1	RES 56kohm	5%	¼W	328563J
	R810	1 1 1 1	RES 47kohm	5%	¼W	328473J
	R811	1 1 1 1	RES 220kohm	5%	¼W	328224J
	R812	1 1 1 1	RES 15kohm	5%	¼W	328153J
	R813	1 1 1 1	RES 100kohm	5%	¼W	328104J
	R814	1 1 1 1	RES 330kohm	5%	¼W	328334J
	R815	1 1 1 1	RES 39kohm	5%	¼W	328393J
	R816	1 1 1 1	MO-RES 2.2kohm	5%	2W	362222B
	R817	1 1 1 1	FP-MO-RES 470ohm	5%	2W	362471L
	F801,802	−2 2 2	Midget fuse – (S) 5AT 250 V			4720410
		−4 4 4	Holder, midget fuse			7050430
			METER/MUTING PCB ASSEMBLY			
	S8,S9	1 1 1 1	Switch, twin push – SUF24			4041050
★505		1 1 1 1	Shield plate			7032170
	D901 ~ D904	4 4 4 4	Diode 1N60P			500001G
	C901,902	2 2 2 2	E-CAP 16R10uf			211220Q
	HVR901, HVR902	2 2 2 2	Potentiometer – HVR EVA-S6A 1kohm			4301120

KEY NO.	SYMBOL NO.	TYPE+ W E N D	DESCRIPTION++			PART NO.
	R601,602	2 2 2 2	RES 12kohm	5%	¼W	328123J
	R603,604	2 2 2 2	RES 100kohm	5%	¼W	328104J
	R901,902	2 2 2 2	RES 6.8kohm	5%	¼W	328682J
	R903,904	2 2 2 2	RES 1.5kohm	5%	¼W	328152J
	R905,906	2 2 2 2	RES 82kohm	5%	¼W	328823J
	R907,908	2 2 2 2	RES 18ohm	5%	¼W	328180J
			HEAD PHONES PCB ASSEMBLY			
		1 1 1 1	Jack, head phones – JL3A			4550260
	R01,R02	2 2 2 2	MO-RES 330ohm	5%	2W	362331B
			LAMP FUSE PCB ASSEMBLY			
	F803	1 − − −	Fuse – 0.5A 250 V MGC			4700560
	F803	−1 1 1	Midget fuse – (S) 500mAT 250 V			4720310
		2 − − −	Fuse holder			7050420
		−2 2 2	Fuse holder, midget fuse			7050430
			POWER AMP FUSE ASSEMBLY			
	F2,F3	−2 2 2	Midget fuse – (S) 5AT 250 V			4720410
		−4 4 4	Fuse holder, midget fuse			7050430

SEMICONDUCTOR DATA

TRANSISTORS

† NOTES Ge: Germanium, Si: Silicon
A: Alloy, B: Base, D: Diffused, Dd: Double-diffused
Df: Drift-field, E: Epitaxial, G: Grown, J: Junction
M: Mesa, P: Planer, Pc: Point-contact, Td: Triple-diffused

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (T_A = 25°C unless otherwise specified)					ELECTRICAL CHARACTERISTICS Typical Values: (T_A = 25°C unless otherwise specified)												MANUFACTURER
			Collector-to-Base Voltage V_{CBO} (V)	Emitter-to-Base Voltage V_{EBO} (V)	Collector Current I_C (mA)	Collector Dissipation P_C (mW)	Junction Temperature T_J (°C)	Collector Cutoff Current I_{CBO} (uA)	V_{CB} (V)	Static Forward-Current Transfer Ratio h_{FE}	V_{CE} (V)	I_C (mA)	Collector-Emitter Saturation Voltage $V_{CE(sat)}$ (V)	I_C (mA)	I_B (mA)	Gain-Bandwidth Product f_T $f_{\alpha b}$* (MHz)	V_{CE} V_{CB}* (V)	I_E I_C* (mA)	Output Capacitance C_{ob} (pF)	Others	
2SA798(G, H)	AF: Low noise differential amp.	PNP, Si-E Dual Tr.	−70	−5	−100	200	125	0.1	−35	400 ~ 800	−6	−1	−0.6 max.	−10	−1	100	−6	−1*	3		MITSUBISHI
2SA817A (O, Y)	AF: Driver	PNP Si-E	−80	−5	−300	600	150	0.1	−50	70 ~ 240	−2	−50	−0.4 max.	−200	−20	100	−10	−10*	14		TOSHIBA
2SA991 (F, E)	AF: Low noise	PNP Si-E	−60	−5	−100	500	125	−0.05	−60	300 ~ 800	−6	−1	−0.5 max.	−100	−10	90	−6	1	5.5		NEC
2SA1015 (Y)	AF:	PNP Si-E (PCT)	−50	−5	−150	400	125	−0.1	−50	120 ~ 240	−6	−2	−0.3 max.	−100	−10	80 min.	−10	1	7 max.		TOSHIBA
2SB649 (B, C)	AF:	PNP Si-E	−180	−5	−1.5A	20W (Tc=25°C)	150	−10	−160	60 ~ 200	−5	−0.15A	−1 max.	−0.5A	−50	140	−5	−0.15A	27		HITACHI
2SB705 (Q, R)	AF: Power amp.	PNP Si-Td	−140	−5	−10A	120W (Tc=25°C)	150	−50	−140	60 ~ 200	−5	−2.0A	−1.5 max.	−5.0A	−500	15	−5	−0.2A*	430		NEC
2SC945L (P, Q)	AF: Low noise general amp.	NPN Si-E	60	5	100	250	125	0.1	60	135 ~ 400	6	1	0.15	100	10	250	6	−10	3.5		NEC
2SC1627 (O, Y)	AF: Driver	NPN Si-E	80	5	300	600	150	0.1	50	70 ~ 240	2	50	0.5 max.	200	10	100	10	10*	10		TOSHIBA
2SC1627A (O, Y)	AF: Driver	NPN Si-E	80	5	400	800	150	0.1	50	70 ~ 240	2	50	0.4 max.	200	20	100	10	10*	10		TOSHIBA
2SC1815 (Y, GR)	RF, AF	NPN Si-E (PCT)	60	5	150	400	125	0.1	60	120 ~ 400	6	2	0.25 max.	100	10	80 min.	10	1*	3.5 max.		TOSHIBA
2SC1844 (F, E)	AF: Low noise amp.	NPN Si-E	60	5	100	500	125	0.05	60	400 ~ 600	6	1	0.1	100	10	100	6	1*	4.8		NEC
2SC2229 (Y)	AF: Driver	NPN Si-Td	200	5	50	800	150	0.1	200	120 ~ 240	5	10	0.5 max.	10	1				5		TOSHIBA
2SD669 (B, C)	AF	NPN Si-E	180	5	1.5A	20W (Tc=25°C)	150	10	160	60 ~ 200	5	0.15A	1.0 max.	0.5A	50	140	5	0.15A*	14		HITACHI
2SD745 (Q, R)	AF: Power amp.	NPN Si-Td	140	5	10A	120W (Tc=25°C)	150	50	140	60 ~ 200	5	2.0A	1.5 max.	5.0A	500	17	5	0.2A*	270		NEC

DIODES, LEDS

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (T_A = 25°C unless otherwise specified)									ELECTRICAL CHARACTERISTICS Typical Values: (T_A = 25°C unless otherwise specified)							MANUFACTURER
			Reverse Surge Voltage V_{Rsurge} (V)	Peak Reverse Voltage V_{RM} (V)	Reverse Voltage V_R (V)	Peak Forward Voltage V_{FM}	Peak Forward Current I_{FM} (mA)	Average Rectified Current I_O (mA)	Forward Surge Current $I_{F\,surge}$ (A)	Junction Temperature T_J (°C)	Total Power Dissipation P_D (mW)	Forward Current I_{Fmin} (mA)	Test Condition V_F (V)	Forward Voltage V_{Fmax} (V)	Test Condition I_F (mA)	Reverse Current I_{Rmax} (uA)	Test Condition V_R (V)	Others	
1N60P	Detector	Ge-Pc		35	25		150	50	0.5	70				1	4	75	10		HITACHI
1S1555	Detector	Si-EP		35	30		300	100	1	150	300			1.4	0.1	0.5	30		TOSHIBA
M4C-41-13	Rectifier	Si-DJ, Bridge	300	200	70			4.5A (Ta=30°C)	200	150				0.95	2.25A	50	200		HITACHI
S5277B	Rectifier	Si-DJ		100			2.0A	1.0A	50	150				1.2	1.0A	10	100		TOSHIBA

ZENER DIODES

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (T_A = 25°C unless otherwise specified)			ELECTRICAL CHARACTERISTICS Typical Values: (T_A = 25°C unless otherwise specified)														MANUFACTURER
			Total Power Dissipation P_D (mW)	Zener Current I_Z (A)	Junction Temperature T_J (°C)	Zener Voltage V_Z MIN (V)	V_Z TYP (V)	V_Z MAX (V)	Test Conditions I_Z (mA)	Differential Resistance r_Z TYP (Ω)	r_Z MAX (Ω)	Test Conditions I_Z (mA)	Temperature Coefficient γ_Z TYP (%/°C)	γ_Z MAX (%/°C)	Test Conditions I_Z (mA)	Reverse Current I_Z MAX (μA)	Test Conditions V_R (V)	Others	
HZ24V-2	Stabilized power supply	Si-EP	500	0.2	175	23.6		24.7	2		70	2	20.3 mV/°C		2				HITACHI
HZ30V-1	Stabilized power supply	Si-EP	500	0.2	175	28.2		29.6	2		100	2	28.3 mV/°C		2				HITACHI